The JOURNAL of GEOGRAPHY

VOLUME XLIV MAY, 1945 NUMBER 5

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VOLUME XLIV MAY, 1945 NUMBER 5

HIGH SCHOOLS AND GEOGRAPHIC IMMATURITY

ELLSWORTH HUNTINGTON
Yale University

The title of this article is not based on the fact that high school pupils are immature. Of course they are. That is why they are in high school instead of college. Their immaturity, however, has nothing to do with the fact that high school geography is also immature and by no means occupies the place which it ought and which it will in due time. This unsatisfactory condition at the high school level is primarily due to a similar condition in the science as a whole. Thus we are faced by a problem which has been discussed for at least a generation, but which will have to be threshed out and settled before the geography of either high schools or colleges attains full stature.

THE WEAKNESS OF GEOGRAPHERS

The primary trouble is that we, the geographers, are almost entirely in the fact-finding stage. One has only to read the geographical magazines and even the Annals of the Association of American Geographers to see that nine out of ten articles are presentations of facts with only a minimum of reference to the principles. Not one in a hundred deals with what may properly be called the advanced phases of geography.

This weakness of geography at the upper levels has unfortunate results. It leads people in general to think that anyone can understand geography and anyone can teach it. We all know that in many high schools and even in some colleges a teacher who can be spared from something else often attempts to teach geography regardless of training. The chemists would not tolerate such a thing. Another unfortunate altho strictly temporary result is that people in general and even geographers say that World War II is rapidly changing geography. Again and again people remark quite seriously that the war will compel us to write our textbooks

all over again. That is sheer nonsense. The war does not touch the fundamental principles of geography any more than the discovery of penicillin and the sulfa drugs touches those of chemistry. It does indeed confront us with new applications of old principles and call upon us to re-examine some of them in a new light. Taken as a whole, however, the science of geography remains the same except that it expands a little because we see its application under new circumstances of human activity.

Grade School Methods at Higher Levels

For our present purposes the most unfortunate result of the immaturity of geography is that because of the poor development at the higher levels we have let the lower levels expand not merely into the high school but into the college. We have allowed the world to think that there is little or nothing to geography except regional descriptions of the various parts of the earth, a rehearsal of what products result from a given combination of soil, minerals, climate and human activity, and some account of how people live. We talk piously about principles, but those that we mainly stress are extremely elementary and are almost lost under a vast body of facts. I know full well that in saying this I indict myself as well as others, but it is best to face the facts.

Sugar-coat it as we will, the plain fact is that unless we branch off into lines such as physiography or meteorology, which are far more mature than geography in general, we find that the ordinary high school course is merely a somewhat expanded grade school course. The ordinary introductory geography course in college is also almost the same thing. It is glorified a little, made more difficult by the addition of new facts, dressed up with a few simple principles, but after all it is not much different from what might have been learned from a good elementary textbook for grade schools. How can we expect a student to be enthusiastic or to get much intellectual stimulus from a study of the regional geography of the United States, North America, and the other continents in grades five and six, let us say, followed by a more extended study of the United States, North America and the other continents in grades nine and ten, and finally topped off by a study of the United States, North America and the other continents along much the same lines in college?

Of course a good teacher can make almost any kind of course both interesting and stimulating. Nevertheless, an examination of

textbooks for elementary schools, high schools and colleges shows little sign of a progressively developed program such as is universal in mathematics. In that science the simplest phases of arithmetic are studied early in the elementary schools. Then thru gradual development the students reach more complex phases in algebra, geometry and trigonometry. In these they study and apply the principles of nearly all branches of mathematics. Thus in the secondary schools they get a broad foundation on which to base still further principles as well as the broader application of old principles for which they are ready in institutions of higher learning.

We can excuse ourselves in part by pleading that the well prepared teacher, with geographic principles and concepts clearly in mind, lays a sound foundation for essential understandings thru her selection of activities and thru emphasis on pertinent data adapted to each grade. But how many teachers are "well prepared?" Much of the responsibility for poor preparation lies with mature geographers, especially textbook writers. We ought to provide organized material by means of which students can proceed from elementary to mature concepts as steadily and surely as they do in moving onward from inorganic qualitative chemistry to the inorganic quantitative phase of the subject and thence to organic chemistry.

A Possible Progression in Method

One such line of progression lies ready to our hands. It may not be the best or the final line, but it is at least logical and interesting. This line begins with pure description mixed with only the most elementary principles. It goes on to regional economies, and finally to a mature study of principles. Each of the later phases of course includes the earlier ones, but the emphasis changes. In the elementary school the stress is rightly laid on the description of countries and their people. Many elementary textbooks are admirable in this respect, and so are many magazines. The wide use of the radio and moving picture is adding still more to the clearness with which an intelligent child is able to visualize the various countries of the world as geographic entities. We do not need to worry about elementary textbooks so much as about teachers who are not properly trained to use these textbooks effectively.

Omitting for a moment the middle stage, which is our main subject, we may briefly dismiss the highest stage. What we need

in our colleges and universities is not more textbooks of the old descriptive kind, but stress on principles. Our college faculties ought to be writing far more articles and monographs that present new points of view, new hypotheses, new interpretations of old facts—writings that are meant only for mature geographers. Such writings ought to be controversial because every new hypothesis or interpretation is of necessity controversial until it has been tested by others in addition to its originators and has also met the test of new facts not known when the hypothesis was originally propounded. We must guard against mistakes, but we must not fear to follow wherever the available facts and our best judgment seem to lead. We must remember that the only people who never make mistakes are those who never do anything. The farther a man goes in the exploration of new realms of thought the more certain he is to make mistakes. A fine example of this is the great geologist, Thomas C. Chamberlin. His bold hypothesis that glaciation is due to changes in the carbon dioxide content of the air has been almost completely rejected. Nevertheless, it was one of the most valuable steps leading to the still unattained goal of an understanding of the causes of glaciation. To me personally no other climatic studies have been more stimulating than Chamberlin's CO_2 hypothesis which I now believe to be substantially wrong. Chamberlin had the kind of courage, imagination, and persistence which we sorely need in order that the upper levels of geography may be successfully cultivated.

The Nature of Regional Economies

Turning now to the middle level of geography let us briefly see how a study based on types of regional economy is appropriate for high schools. The simplest type of human economy is found where subsistence depends almost entirely on animals. The high school student is old enough to see significance in the fact that the diverse modes of life among Eskimos, Arabs, Bushmen, Scotch shepherds and the cattle ranchers of Australia and our own high plains are all alike in the following respects: (1) they are limited to parts of the world where agriculture is not feasible except in spots such as oases; (2) they depend on vegetation, primarily grass, which is eaten by animals; (3) the animals supply meat, milk, horns, bones, hides, wool, hair, and other products which are practically the only resources upon which the people can rely for food, clothing and shelter, or for use as a means of exchange for articles produced in

some other economy; (4) where this type of economy prevails without the help of any other the population is inevitably sparse in comparison with that of other economies where civilization is equally advanced; (5) such sparsity leads to special habits, problems and difficulties along lines such as markets, education, and government, as well as in the more obvious conditions of food, dress, shelter, tools, equipment, and transportation which have been stressed in the elementary grades.

Another phase of the matter is that altho all animal economies are alike in certain respects, they vary greatly according to stage of development and the degree to which they have contact with other economies. The primitive Bushmen of the Kalahari Desert are very different from the cattle ranchers of western Texas. Yet both in a very real sense belong to the great category of animal economies. And in both an animal economy prevails because man has not yet discovered any way to utilize certain areas except by means of either wild or domestic animals.

WORLD UNITY OF ANIMAL ECONOMIES

Let us amplify this subject a little and see how animal economies illustrate certain principles: (1) The inhabitants of all regions tend to adapt their way of life to their geographic surroundings. Thus in all the vast areas which are too cold, too dry, too wet or otherwise too extreme for agriculture, that is, in more than half the world's lands, an animal economy almost invariably prevails except in small spots where special resources foster mining, lumbering, or practises such as irrigation. Moreover, thruout the broad areas where animal economies prevail there are certain common characteristics except in the most highly developed types, such as that of Denmark. Elsewhere the people are few in number, poor, and often migratory. They live in small and isolated groups, have little trade, poor transportation facilities, and great uniformity of occupation. Schools, churches, libraries and other evidences of high civilization are scarce or absent because of a low stage of culture or because of their costliness and because it is difficult to gather enough people in any one place.

(2) Another principle is that people's response to a given environment varies according to both their stage of progress and their degree of contact with people having other types of economies. Hence in spite of certain similarities among all animal economies there are great differences. In subsistence economies of the

animal type, for example, people not only live largely on animal food, but make their clothing, tools and shelter largely from animal products or else from other strictly local resources. In an exchange economy of the animal type, on the contrary, people sell most of their products for money which they ultimately exchange for food, clothing and practically every commodity that they make use of. Some exchange economies, such as that of the fur hunters of the northern forests, are poor and backward, but others, such as the cattle ranchers in the western United States and Australia, are prosperous and advanced.

(3) Another principle is that each of the many factors of the physical environment produces its own special effect upon human habits, and also modifies the effect of other factors. For example, animal economies in regions where the whole of a vast area is cold because of high latitude have had little effect on history. The Eskimos of North America, the Samoyedes of Asia, the Lapps of Europe, and the Alacaluf of South America are important as geographical types, but not as an influence on other people. On the other hand, where the coldness is due to altitude rather than latitude, as on plateaus, and where the surrounding region is relatively warm, people with animal economies often have had a great effect on those around them. The highland Scotch, the ancient Medes and Persians, and the Masai of Africa illustrate this. Such highland shepherds or herders tend to be unusually strong and vigorous. They have repeatedly conquered the neighboring agricultural people.

(4) Pastoral nomads of dry regions—steppes and deserts—have been an especially noteworthy factor in history. Their horses and camels have given them ease of movement, thus helping them in fighting. The hardships of migration, especially of seasonal migration between dry lowlands and cool plateaus, have weeded out physical weaklings. Raids on other tribes have eliminated cowards and fostered a spirit of leadership. The warlike Mongols, Arabs, Huns, Turks and others illustrate the way in which such nomads, spilling out from the steppes, have conquered and ruled large parts of Asia, Europe, and North Africa.

(5) The kinds of animals on which people rely for a living influence not only the mode of life but the character of the people. Some animal economies are based on the creatures of the sea. If such an economy cannot systematically make contact with other economies it almost inevitably assumes the subsistence type and remains at a low level like that of the remote Eskimos who buy

nothing from outsiders. On the other hand, if a fishing economy is closely allied with some other economy of an advanced type, it tends to become an almost complete exchange economy, making direct use of scarcely any part of its own product, as is true of modern fishermen on both coasts of the United States. Hunting seals on the ice and managing a steam trawl demand quite different types of ability, but both make special demands for physical hardihood, initiative, self-reliance, and ability to make sudden decisions and take quick action. The work of the dairyman, on the other hand, puts a high premium on the temperament which is especially good at doing the same job over and over again without fail. It may be that during generation after generation the people who are weak in self-reliance, for example, but strong on patient repetition of the same task tend to die out in primitive animal economies but to survive in large numbers among dairymen. One of the geographer's great unsolved problems is the extent to which qualities of such kinds tend to become hereditary so that there is an actual biological difference of temperament among people who practise diverse economies.

(6) Cattle are by far the most important of the animals upon which mankind depends. In Africa semi-nomadic cattle economies dominate nearly as much space as camel economies, but support a far greater population. Moreover, cattle are the chief basis of animal economies that rise to a high level of progress, as we see in Ireland and Iowa. They are the only animal economies that support a population that is dense as well as progressive. Denmark, with its cooperatives, its art, its high education, and its spirit of progress illustrates the highest level of animal economies, just as the Alacaluf with their shellfish and almost self-supporting little children illustrate the lowest.

(7) The more intimately people's work brings them into contact with nature, the more direct and evident is the effect of the geographic environment. Because of their direct relationship to nature all kinds of animal economies are peculiarly sensitive to the variations in weather which occur in irregular cycles all over the world. Nomadic tribes have again and again been driven out of their homes in steppes and deserts because their numbers have become too great to be supported when a dry season causes the grass to fail and springs to dry up. At such times the grass near the dry springs cannot be used because it is too far from water, and the supply of grass near the water that is still available is less than usual. Strife among neighboring tribes and outward movements

to more favored regions are the natural result, as has been repeatedly seen among the Arabs and Mongols. At the other extreme cool, moist countries like Ireland suffer at times of storminess. Agriculture becomes difficult, and people are forced to rely on cattle instead of crops. The number who can be supported on a given area is much diminished. There, too, the people are impelled to strive with their neighbors for the best places and to migrate outward, as in the great Irish migration to America. Thus the borders of the areas with animal economies tend to be regions of political and social tension and strife, thereby exerting a great effect upon history.

Other Economies and High School Teaching

Plant economies can be treated in the same way as animal economies. They range from the primitive tropical milpa type of agriculture, with its temporary fields cultivated only a year or two, up to the intensive horticulture of Holland with its huge greenhouses wherein both soil and climate are manufactured. Where the simpler forms of plant economy prevail, as in the interior of Yucatan or even South China, they are almost unmixed with others. Even in regions such as the Dakotas and southern Russia an extensive type of plant economy based on cereals dominates large areas with only a little admixture of the commercial and industrial types. Nevertheless, the higher the type of civilization, the more fully are different economies brought together to supplement one another. Thus in North Dakota many great farms depend almost entirely upon wheat and have scarcely any animals. Their tractors, combines and other machines, however, belong to the industrial type of economy, and their hard roads, railroads, grain elevators, and market towns belong to a commercial economy. Among the banana raisers of Uganda, on the contrary, neither animals, machines, or trade play any prominent part. Thus, in plant economies as well as in animal economies we find almost pure types in the parts of the world that are less favored geographically, whereas, in more favored regions we find types which still are definitely dependent on plants, but which also make use of the facilities and products of other economies.

There is not space here to consider commercial, industrial, and other economies. The former in an almost pure form are found in the cities of many tropical regions. The industrial type reaches its most distinctive development in places such as the factory towns near Pittsburgh or the English Birmingham. Those cities them-

selves, however, and many others combine the commercial and industrial types of economy, and therefore have many characteristics in common.

Taking the world as a whole a most illuminating high school study might begin with the animal economies which prevail over far more than half of the earth's land surface and occupy practically all the space in areas too cold or dry for agriculture. It might go on to analyze plant economies which also prevail widely, but not over anywhere near such broad areas as the animal economies. The students would see how some such economies, being of a backward type, depend almost entirely on plants, as in much of Guatemala, whereas others, less backward, combine a plant and an animal economy, as in rural France. The next step would be to understand how advanced plant economies add also the commercial and industrial types, as on a sugar plantation. The commercial type in turn is distributed in spotted fashion in many parts of the earth, as is the mining type. So, too, is the industrial type in its simpler forms, but in its most complex and intensive aspect it is largely limited to certain definite areas in temperate latitudes.

If high school students could see the world in terms of a few great types of economies, their picture of the life and products of the various countries would become vastly more clear. They would see that in the less favored parts civilization is generally low. Except for small spots where mines, irrigation, or trade introduce something else, only a single type of economy prevails. Other types are impracticable for lack of resources or transportation, or because they require so much work that they do not pay. Thus the geographic environment holds people down to few and simple occupations, prevents the population as a whole from being either dense or wealthy, and retards the progress of civilization. Elsewhere, especially favorable combinations of geographical conditions permit all kinds of economies to thrive together. There people can live in large numbers, practising all kinds of occupations, gaining wealth, and progressing rapidly.

Such an approach, as we have already said, is only one of the ways in which high school geography may acquire the kind of definite character which is necessary if it is to challenge the interest of both pupils and teachers. Only by acquiring this character can it be a genuine stepping stone from the simpler geography of the elementary schools to the geography of crystallized principles that ought to be taught in colleges.

THE INTER-AMERICAN HIGHWAY

EDWIN W. JAMES
Chief, Inter-American Regional Office, Public Roads Administration

"America is a continent. *** America occupies, in solitary grandeur, the entire Western Hemisphere. *** Stately, powerful, unique; such is physical America, discovered by accident, named by mistake." "Columbus discovered America in 1492. Americans waited until 1942."—So speaks Luis Quintanilla in his recent book, "A Latin American Speaks."

Dr. Quintanilla's statement may be emphasized by adding that it has required the repercussions of two global wars to awaken the people of the United States to the facts as they are slowly and somewhat onerously developing. Pearl Harbor changed the face of things as they were. The United States government suddenly realized that at Panama in the Canal Zone and its surroundings it had not only a huge investment in money but a profoundly vital interest.

Simultaneously, all the Americas realized their geographical unity and solidarity. The western continent—the American continent—was isolated by war. Exports to Europe vanished; exports even to the northern half of the Continent dwindled because water transport alone had been developed in the past.

Steps were at once taken to open a thru overland route between the United States and Panama. Funds were made available, surveys of the incomplete sections were started and plans made to construct a pioneer road across all the gaps lacking all-weather surfaces.

These gaps aggregated 1060 kilometers and occurred in every country south of Guatemala. The surveys required stretched to more than 790 kilometers.

The amount of heavy construction and the unusual number of bridges led at once to an adjustment which would provide the most convenient and practicable rail and highway combination from the United States to Panama. This arrangement contemplated the use of the standard guage railroads in Mexico to the southern frontier at Tapachula or Suchiate and a pioneer road from either or both of those points to Panama. Such a combination would make thru traffic possible with a single transfer from rail to truck.

The pioneer road project was authorized in June, 1942 by two directives from military authorities, one providing for immediate surveys and the other for construction of a surfaced road on the location of the proposed Inter-American Highway, over all sections

which did not at the time have all-weather surfaces. The pioneer road surface was to have a minimum width of ten feet, and a thickness of eight inches of compacted gravel or crushed stone without artificial binder. A maximum controlling grade was set at 10 per cent with a tolerance up to 12 per cent for short distances. No maximum curvature was set as it was expected that the construction would follow the alignment standards of the Inter-American Highway. Advantage was to be taken of the fact that where alignment is fixed a variety of profiles can be laid. With the low standards of the pioneer road and the higher standards of the ultimate Inter-American Highway this process, if carried thru, would assure that only a small fraction of the work on the pioneer road would be discarded in final construction.

An adjustment had to be made also with respect to bridges and culverts. The total number of bridges over twenty feet in length remaining to be built between the southern Mexican frontier and the Panama Canal Zone was 97, and the very large footage of box and pipe culverts needed could be determined only after completion of surveys. It was obviously impossible with restrictions that affected steel to fabricate all the needed bridges, or provide reinforcement for so large an amount of concrete as would be required for culverts. It was stipulated therefore that certain hazardous bridges should, if possible, be completed according to final standards adopted for the Inter-American Highway and that other bridges should be made temporary structures, of wood, steel or masonry, built somewhat down stream and off line, if possible. Culverts were treated the same way. Certain ones that could be built exactly in line and at grade of finally anticipated profile could be made permanent, others should be temporary. It was expected that even some log culverts might be built in the temporary class.

Construction was to be handled jointly by the Public Roads Administration and the U. S. Engineer Corps and because of the conditions existing it was decided to do the entire job so far as possible by contract. The Engineer Corps was responsible for the pioneer road work and Public Roads Administration for the standard work on roads, bridges and culverts regardless of whether the drainage structures were on pioneer or standard sections of the road. In all, nine contracts were let for roads and bridges covering a total of 1405 kilometers of highway and some eighteen bridges.

Three of the Republics having highway organizations partly or wholly equipped took contracts to construct the sections of pioneer

road included within their limits. Guatemala undertook to reconstruct an existing dirt wagon road from Malcatan via Ayutla, Retalhuleu, to Escuintla. El Salvador contracted to reconstruct and extend a road from San Miguel via Santa Rosa to the Goascoran River, and Nicaragua agreed to build a new road from the vicinity

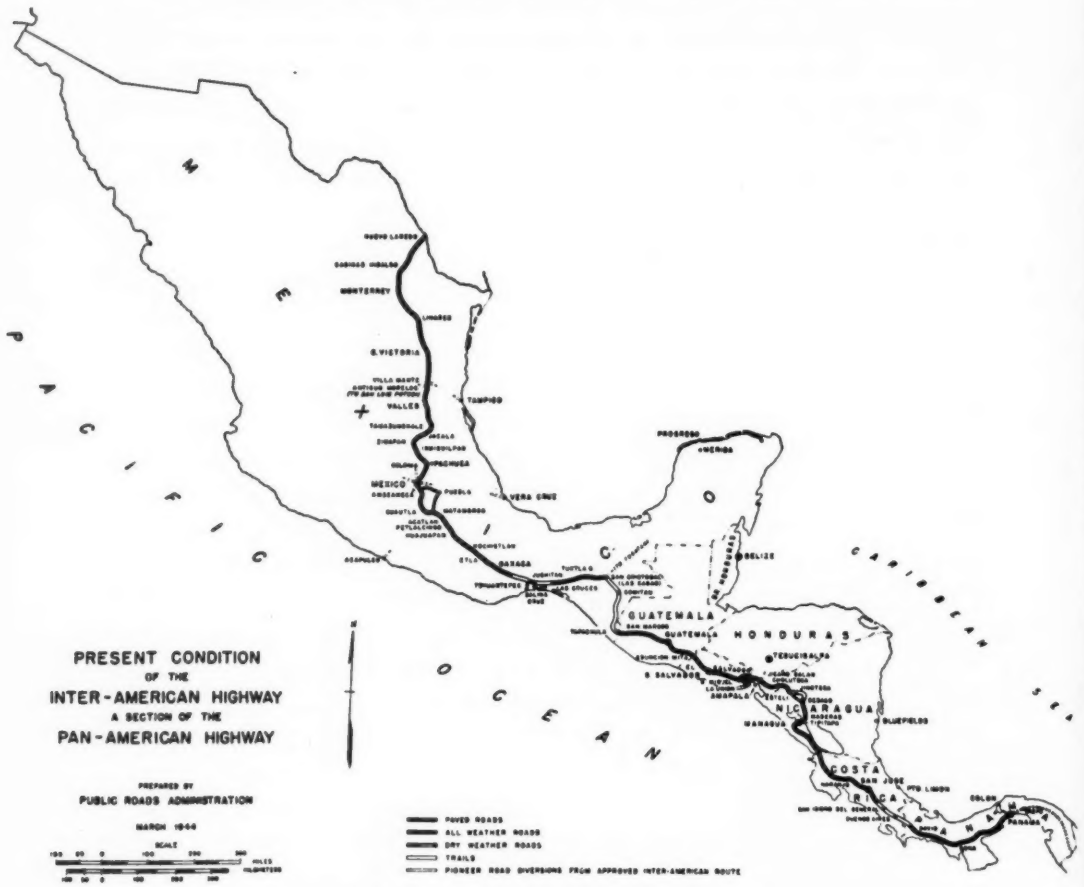


Fig. 1. Map of the Inter-American Highway

of Jinotope via Nandains, Rivas and La Virgen to the Costa Rica Frontier. It was necessary to provide Guatemala and El Salvador with some additional equipment to that available to the highway department. Such equipment was furnished on a rental basis.

Private contracts were made with the Foundation Company of New York, Martin Wunderlich Company of Jefferson City, Missouri, with Swinnerton, McClure and Vinnell of San Francisco, and with Ralph E. Mills Company of Frankfort, Kentucky, for

CONDITION AND LENGTH OF INTER-AMERICAN HIGHWAY

	Condition	Length Kms.	Miles
MEXICO			
Nuevo Laredo—Mexico City	Paved	1226	762
Mexico City—Cuautla	Paved	104	65
Cuautla—Jonacatepec	All weather	30	19
Jonacatepec—Matamoros	Dry weather	40	25
Matamoros—Tepozcolula	Paved	223	139
Tepozcolula—Nochistlan	All weather	25	15
Nochistlan—Caxaca	All weather	105	65
Caxaca—El Portillo	All weather	70	44
El Portillo—Nejapa	Dry weather	81	50
Nejapa—Juchitan	Trail	123	76
	Dry weather	50	31
Juchitan—Las Cruces	Trail	181	112
Las Cruces—Chiapa	Paved	117	73
Chiapa—(San Cristobal) Las Casas	Dry weather	69	43
(San Cristobal) Las Casas—Comitan	Trail	98	61
Comitan—Tapachula	Trail	253	157
Tapachula—Guatemala Border	Paved	18	11
TOTAL MEXICO		2813	1748
GUATEMALA			
Mexico Border—Guatemala City	All weather	316	196
Guatemala City—El Salvador Border	All weather	167	104
TOTAL GUATEMALA		483	300
EL SALVADOR			
Guatemala Border—San Salvador	Paved	97	61
San Salvador—San Miguel	Paved	137	85
San Miguel—La Union	All weather	47	29
Sirama—Honduras Border	Dry weather	34	21
TOTAL EL SALVADOR		315	196
HONDURAS			
El Salvador Border—Nacaome	All weather	35	22
Nacaome—Jicaro Galan	Dry weather	5	3
Jicaro Galan—Choluteca	All weather	45	28
Choluteca—Las Cabezas	All weather	16	10
Las Cabezas—Banquito	Dry weather	14	9
Banquito—San Marcos	All weather	25	16
San Marcos—Nicaragua Border	Dry weather	12	7
TOTAL HONDURAS		152	95
NICARAGUA			
Honduras Border—Pueblo Nuevo	Dry weather	35	22
Pueblo Nuevo—Condega	All weather	21	13
Condega—Matagalpa	Trail	86	53
Matagalpa—Sebaco	All weather	21	13
Sebaco—Maderas	All weather	52	32
Maderas—Managua	Paved	52	32
Managua—Diriamba	Paved	43	27

	Condition	Length Kms.	Miles
Diriamba—Nandaime	All weather	24	15
Nandaime—Rivas	All weather	45	28
Rivas—Costa Rica Border	All weather	35	22
TOTAL NICARAGUA		415	257
COSTA RICA			
Nicaragua Border—Liberia	Dry weather	79	49
Liberia—Bagaces	Dry weather	26	16
Bagaces—Las Canas	All weather	22	14
Las Canas—Esparta	Dry weather	77	48
	All weather	10	6
Esparta—San Ramon	Dry weather	18	11
	All weather	13	8
San Ramon—Naranjo	All weather	21	13
Naranjo—San Jose	Paved	55	34
San Jose—Cartago	Paved	22	14
Cartago—El Empalme	All weather	29	18
El Empalme—Angostura	All weather	45	28
Angostura—San Isidro	Trail	40	25
San Isidro—Buenos Aires	Trail	59	37
Buenos Aires—Paso Real	Trail	31	19
Paso Real—Panama Border	Trail	69	43
TOTAL COSTA RICA		616	383
PANAMA			
Costa Rica Border—Volcan	Trail	53	33
Volcan—Concepcion	All weather	35	22
Concepcion—David	All weather	25	16
David—Santiago	All weather	232	144
Santiago—Rio Hato	Paved	133	83
Rio Hato—Panama City	Paved	128	79
TOTAL PANAMA		606	377
		Kms.	Miles
GRAND TOTAL		5399	3356

road construction; and with the Frederick Snare Corporation for bridge substructures and steel erection. Bridge steel was fabricated by contract by the United States Steel Export Company. The Swinnerton contract covers the section of pioneer road in Honduras from the Goascoran River at the Salvador border to El Espino on the Nicaraguan line, via Nacaome, Choluteca and San Marvos, following thruout the location proposed for the final standard construction on the Inter-American Highway. The total length in Honduras is 164 kilometers. In addition, the Swinnerton associates have the northern section in Nicaragua from the Honduras line via Somoto, Condega and Estoli, to Sebaco, where present standard construction is picked up and continues to Jinotepe. The Foundation Company undertook to construct the section in northwestern

Costa Rica from the Nicaragua line, practically at the shore of Lake Nicaragua to Naranjo, via La Cruz, Liberia, Canas and San Ramon. Difficulties, later referred to, in securing equipment and supplies led to the termination of the contract with the Foundation Company and at this time work is being carried on by force account.

The Ralph E. Mills Company has a very difficult section in Central Costa Rica from Cartago to San Isidro del General, about 94 kilometers long, that crosses the continental divide at an eleva-

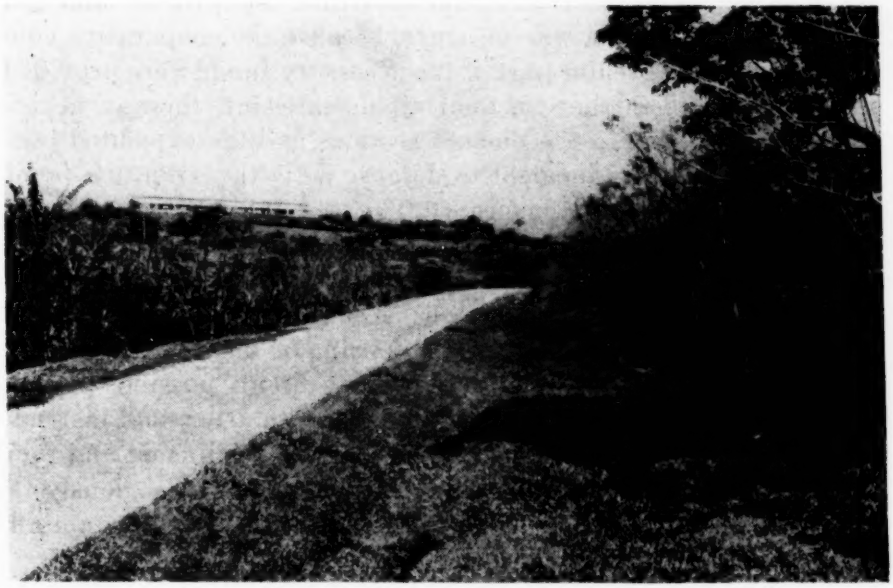


Fig. 2. Costa Rica—Entering Grecia

tion of 10,931 feet in extremely rough terrain. Wunderlich continues the work in Southern Costa Rica down El General Valley via Buenos Aires and Paso Real to the Panama frontier at the crest of the Santa Clara range, thence across the Chiriqui Plateau, and down the mountain to Concepcion and David at which latter place terminates the construction of the Central Highway in Panama from the Canal Zone, 493 kilometers to the east.

The Frederick Snare Corporation was awarded a contract to construct six bridges: One at the Goascoran River, on the Honduras-El Salvador line; two in Honduras at the Guacirope and the Rio Grande near Nacaome; one at the Ochomogo north of Rivas, Nicaragua; and one each at El General and Brus rivers in southern Costa Rica. This contract has been augmented by additional bridges

as steel has been made available. Three additional structures in Nicaragua at the Rio Grande, Aguacatasta and Calabazas, for which substructures are already complete were first added and later nine structures in Costa Rica were included. These latter with one exception lie in El General Valley between the General and Brus bridges originally provided for.

As should be expected, under the circumstances coincident with the development of this construction program, the difficulties of organization have been exceptional. Altho the project was not undertaken solely as a war measure, because the cooperative construction and the greater part of the necessary funds were provided before the forced entrance of the United States into the war, nevertheless the addition of the pioneer sections and the expedited program were obviously incident to defense activities from the point of view of transportation insurance. The original plan called for the completion of all surveys, the letting of all contracts, the assembling of all required equipment at convenient points in Central America, the construction of camps and the accumulation of supplies by November 15, 1942, so that with the opening of the dry season construction could be started simultaneously at all possible points. Contracts were let in August less than a month after final instructions to proceed. But the difficulties in securing equipment and forwarding it to points in Central America were such as seriously to retard the initial organization and preparation. Even today not all needed equipment has arrived on the respective sections.

The original program called for completion of surveys by November 15, 1942 and completion of the pioneer road by May 15, 1943, at which time the rainy season might be expected to open. This provided for about six months of construction season for 1637 kilometers of road under eight contractors or roughly 35 kilometers per month per outfit. As some sections of the route could be approached at numerous points besides the ends it was expected that enough construction gangs would be put to work to complete such a program with relative ease.

The almost complete failure of transportation by water to Central America from ports of the United States on both coasts not only quite destroyed the possibility of carrying out the original program, but emphasized as almost nothing else could the necessity for the very project that was being prevented by the inevitable course of events. Indeed, so keen became the pressure to secure

some outlet from Central America that plans were successfully carried forward to construct a railroad bridge at the Suchiate River between the towns of Mariscal and Ayutla at the head of rails respectively in Mexico and Guatemala. But the building of the bridge and the creation of a freight transfer station at Ayutla, Guatemala, did not come in time to relieve the need and so difficult became shipping conditions that one contractor was entirely unable to equip his job and the contract was cancelled.

Fig. 3. This modernized, dumping bull cart is at work on the Tipitapa-Maderas section of the Inter-American Highway in Nicaragua. Most of the highway is being built with modern machinery, but considerable hand labor also is used, as well as such ancient equipment as this cart.

Other difficulties have been encountered that were not to be expected. The rainy season that normally would have tapered off to three or four inches for December with most of that before the 15th of the month carried on almost unabated in the upper elevations and often in the lower into January, February and even into March in some places. As the job was in large part one of making the dirt fly, the continued rains rather effectively interfered.

The completion of the instrument survey over the hitherto unsurveyed section of the continental divide in Costa Rica revealed an exaggerated series of conditions, expected in lesser degree but occurring far beyond anything previously contemplated. It was known from reconnaissance surveys carried out over wide areas in

southern Costa Rica that the construction there would probably be the most difficult between Mexico and the Canal Zone. It was thought that the elevations already reached in Mexico and Guatemala would exceed anything required to get over the continental divide in Costa Rica. But the section between Cartago and San Isidro del General in Costa Rica is far the most difficult to construct between Alaska and the Canal Zone.

Fig. 4. Road construction on Inter-American Highway in Mexico

The altitude at the pass as developed by instrument surveys is 10,931 feet, about 400 feet higher than any other point along the route. There are about 30 kilometers of heavy rock excavation along the highest part of the line where a volcanic dike rises thru the sharp slopes of the cordillera and comes so close to the surface as to enter the road prism thruout a long series of cuts. This source dike makes the descent from the pass to within about 15 kilometers of San Isidro extremely difficult. The average excavation for 27 kilometers will exceed 157,000 cubic meters a kilometer and one kilometer will run above 366,000 cubic meters. This is roughly

760,000 cubic yards a mile. Engineers of Public Roads Administration who are familiar wth the heaviest highway construction in the United States over the Rockies and in the high Sierras pronounce this section the heaviest road work ever encountered anywhere. Reconnaissance conducted at intervals over several years in a fruitless effort to pierce the coast range on a more favorable route thru a mythical low pass, convinces all concerned that with the well known Meseta Central and the valley of El General River as objectives no better route can be found. Shunk, who was in charge of the Inter-continental Railroad surveys in the late 1880's, did not attempt to reach either objective, declaring the latter altogether too difficult even to attempt. The highway over the continental divide between Cartago and San Isidro, about 94 kilometers in total length, will start at an elevation of about 5,000 feet, climb to 10,931 and descend to 2,500 feet at San Isidro,—that is, climb a mile up and a mile and a half down.

To have constructed a pioneer road across this area would be about as difficult to build to final width, providing, of course, the final line was to be followed. To have abandoned the final proposed line in favor of one following around the contours would have resulted in a road dangerous in the extreme if indeed possible in view of the sheer rock precipices that occur intermittently thruout the higher altitudes. So thru this section, included in the Mills contract, the standard line will be followed with some concession in the proposed standard grades. Where completed, this section will constitute one of the most scenic and impressive stretches on the entire line from the United States to the Canal. The Atlantic and the Pacific will both be visible from the top at many points—the Pacific over thirty miles away—and the Atlantic over fifty.

Owing to the slow start and the continuing difficulties of transportation of equipment, supplies and materials, the original program will not be possible. But the road will be constructed either as a pioneer or standard highway across Guatemala, Salvador, Honduras, Nicaragua and Panama by July 1, 1944, and Costa Rica should be thru by July of the following year. Probably a pilot road, sufficient for the passing of construction equipment will be completed in the Costa Rica section this year.

Following the completion of the pioneer road sections, standard road construction will proceed without interruption. The surface will be widened to six meters and the grade to nine. The profile will

be corrected where necessary to conform to the standard specifications of 6 per cent and compensated 7 per cent where necessary. Temporary structures where now introduced will be rebuilt in permanent form and the entire surface finished with a bituminous penetration or surface treatment. The total length on the combined standard and pioneer route from the Suchiate River at the southern Mexican frontier to Balboa basin in the Canal Zone will be 2,561 kilometers.

OUR TROPICAL OUTPOST IN VENEZUELA

LT. (J.G.) WILLIAM BURCHFIEL, JR., USNR
Sevierville, Tennessee

Most of us have never heard of Caripito (pronounced "carrapito"), an American outpost deep in the jungles of South America. This tropical village owes its economic life and development to the production of petroleum. Lying ten degrees north of the equator, it is located in northeastern Venezuela about one hundred and twenty-five miles west of the island of Trinidad. Situated little more than three miles west of the Rio San Juan which flows into the Gulf of Paria, the approach to this secluded spot is almost completely by water except for a short railway connection.

From the bank of Rio San Juan, a narrow gauge railroad has been built over a vast swamp which terminates at Caripito. Its tracks have been laid on a high trestle above luxuriantly vegetated marsh land to prevent flooding during the rainy season. A baby gasoline driven engine pulls an open air passenger car with crudely built wooden seats at a speed not in excess of ten miles per hour from wharf to terminal. The "Speeder," as it is called, completes its three mile schedule trip in about thirty minutes. It usually makes three or four stops en route to pick up workers who have been repairing railroad ties, spraying the swamps for mosquito control, or cutting the incredibly fast growing wild savanna grasses with their razor-edged machetes. The "Speeder" comes to a halt at the base of a one hundred foot summit. From this point, it is necessary to continue by auto up a steep, winding road one-half mile to Caripito.

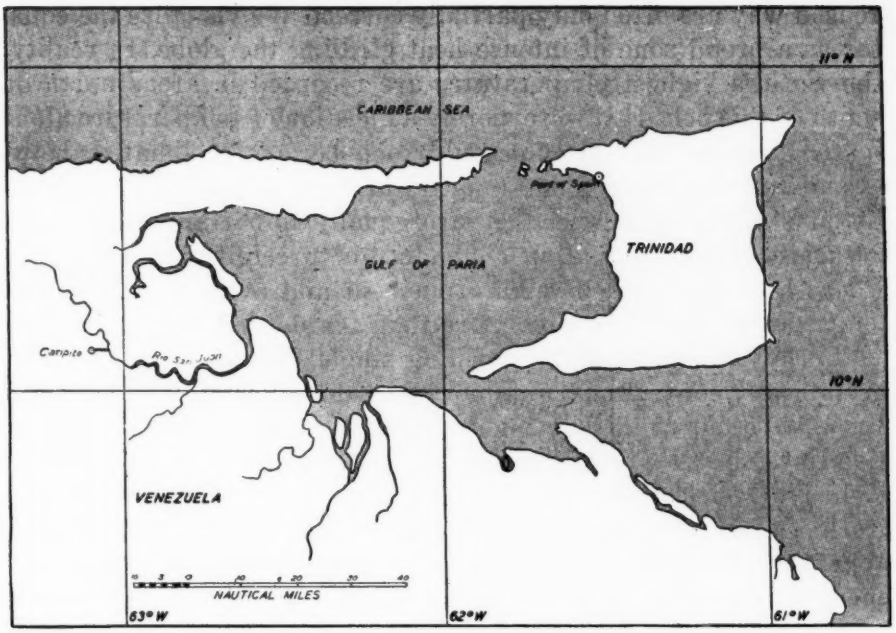


FIG. 1. Sketch map of the Caripito region

CARIB BACKGROUND

Caripito was named in honor of the Carib Indians, 16th Century dwellers in adjacent swamps. These lowland Indians were primarily hunters, fishermen, and migratory cultivators. They were inferior in many respects to their racial brothers who inhabited nearby highlands. Perhaps their inferior culture was due to climatic conditions, especially higher temperatures, which in the tropics are always conducive to a less energetic life. However, other factors such as contaminated water, unstable diet, and the presence of mosquitoes and other insects may have played an important role in the destiny of this tribe. With the coming of the Spanish, during the first part of the sixteenth century, contact was made with the Indians all along the eastern coast of Venezuela. It did not take the ruthless Spanish explorers many generations to liquidate the pure Caribs thru intermarriage, slave labor, and epidemics of measles and smallpox introduced from the Old World.

TROPICAL CLIMATIC HAZARDS

Most of us realize that the tropics have constantly discouraged any form of mass immigration. But our concepts of the

reason why are often only partially correct. We visualize the equator as a broad zone of intense heat girdling the globe. In reality, the world's highest temperatures are recorded in areas north or south of this belt. If it were merely a question of temperature alone in the tropics, most people could soon become acclimated. However, human comfort is not a matter of temperature alone; humidity and monotony of weather are equally important. One would naturally expect to find an abundance of precipitation in regions where humidity exceeds eighty per cent and average daily mean temperature never deviates more than ten degrees.

Perhaps the most distinguishing single feature of this section is its heavy convectional rains of short duration, which have been known to occur at the same hour each afternoon for forty consecutive days. For a month during the wet season (April to October inclusive), one can almost set his watch by the coming of a tropical storm. After the storm has ceased, "Old Sol" makes his immediate appearance, drying the earth almost as quickly as it was dampened, sapping still more of the individual's energy with his direct rays. Just before dark, when local breezes of the daytime have died down, increasing humidity becomes much more noticeable, especially for those who must wear clothes. The sky becomes brilliantly illuminated with flashes of lightning which play among the towering banks of dull black clouds along the mountain slopes. Then darkness quickly falls upon the jungles, heavy dew collects on all objects near the ground, and wild life settles down to rest after another day of monotonous weather.

Mixed Blood Streams

At present, this outpost has a population of 4,200, consisting of approximately 3,700 natives and 500 foreigners. Mestizo, mixed Indian and white stock predominates. The mixture of native Venezeulan blood together with mixed European comprises more than three-fourths of the total population. The remainder are mulattos, mixture of white and Negro blood, and zambos, mixture of Indian and Negro. In addition there are a few pure Negroes. Indians of pure blood are a rarity. A native is usually of dark complexion, rather short and thin, slow in movement, and invariably has bad teeth. He slouches about in a pair of blue pants, a dirty shirt, straw hat with a huge brim and a pair of sandals or zapotas that are usually three sizes too large. By experience, he has learned that it is absolutely essential to wear some sort of sandals to prevent

infectious foot disease, particularly ring-worm, which is common in all tropical zones. He seldom washes or shaves except for some special religious occasion, or when nature assists him with its daily downpours. The slightest deviation from his normal mode of life creates in him an acute sense of suspicion and superstition.

Tho religion plays a major role in an average native's life, ninety-eight per cent being of Roman Catholic faith, unblessed marriages are common, the opinion being that fifty Bolivars ($16.50) is an exaggerated sum for a marriage license. Prolificacy flourishes. The birth rate is extremely high, but population is constantly being equalized by infant mortality. The woman plays domestic drudge, bearing children, caring for home and garden, gathering fruit from nearby jungles and performing all the home rituals.

FIG. 2. Making a cayaca, along Rio San Juan. (Courtesy of American Museum of Natural History, New York)

Some of the more industrious men are employed to care for herds of goats which graze on green pastures of the nearby lofty mountain haciendas; others are employed by the petroleum industry and are considered good workers; but the majority do little work other than that which is absolutely necessary to maintain an existence. As time goes on, more and more of the natives are becoming skilled and efficient, thus gradually improving their standard of living. These improvements have been brought about chiefly by outside influences.

Caripito is divided into two distinct sections, a white camp for foreigners and a pueblo village for natives. The pueblo village contains more than six hundred small huts closely compacted into an area about the size of two city blocks. Flies and rodents are present in incredible numbers. Inadequate garbage disposal and polluted drinking water adds to the flourishing of disease. Perhaps the greatest factor in the unsanitary conditions, however, is the total ignorance the natives display toward personal hygiene. A typical single room dwelling consists of a bamboo frame with adobe mud walls, bamboo roof and earthen floor. There is a single entrance, and screening is negligible. At night a smoldering fire is kindled to expel the myriads of insects which are present at all times. Some of the more prosperous natives have hammocks in which to sleep. Others rest on carpets or the earth itself.

Native diet includes rice, beans, potatoes, bananas, citrus fruit, pineapples, coconuts, mangoes, and cassava which is the staff of life. Cassava is made into a bread by taking the tuberous roots of a manioc plant, which yields a nutritious starch, and grinding them into a pulp, drying the pulp to eliminate poisonous juices and adding water before baking. There are three varieties of bananas grown, small lady-finger variety, average or medium, and the plantain which must be cooked before being eaten. It has a combination banana-sweet potato taste when baked in a large black iron pot over a glowing fire for twenty-five or thirty minutes. Plantain is one stable food that is found in every home.

Oasis in Tropical Setting

The white camp, residence of all foreigners, lies one-half mile to the south of the pueblo village. Between the two sections, there is a vivid contrast in structure, environment, and in standard of living. Here we find attractive dwellings of red and yellow brick, tin roofs, and tile floors with sanitary importations from the United States. This type of building has the advantages of preventing termites which play havoc with all wooden dwellings in the tropics; also, brick serves as an excellent insulator during hot sultry afternoons. Each residence is planned so as to afford as much ventilation as possible. Huge windows are built on all four sides and to each is attached a snuggly fitted mosquito proof screen, and over it a storm shutter that can be opened or closed on a moment's notice during sudden afternoon downpours.

Almost every white home has a modern kitchen with all the

latest appliances, private bath, modern furniture, Venetian blinds and dial telephone. An indispensable short-wave radio is always found in the living room, over which the latest war news and stock market quotations are heard each evening. The only regular news medium available is *Time Magazine* which is flown down every Friday via Pan-American Airlines. Aside from a lack of newspapers, these people enjoy all the home comforts that we cherish in America.

A visiting American is not a common occurrence, and consequently, an all out effort is made to provide an interesting, enjoyable and comfortable stay. The length at which one is made to feel at home is impressive. Conversation is kept happy and gay. One's thoughts and beliefs are accepted with enthusiasm, at least on the surface. Special dinners are a "must" since the hostess takes infinite pride in her limited opportunity to entertain new guests.

FIG. 3. Typical thatched roof house of Arima, near Trinidad. This house is also typical of Caripito

Around the average home is a well kept lawn with countless varieties of tropical flowers and shrubbery continuously blooming. Some lawns are shaded by the cashew tree; others are shaded by the fruit bearing papaw tree. Many lawns have gardenia shrubs which bring forth large fragrant white and yellow flowers thruout the year. It is common to see a well laid brick walk leading from the porch to a nearby garage, which invariably is a double one, with space for the company's auto and their private car.

These people have practically the same diet as Americans at home with the exception of apples, oranges, and fresh milk. Strange as it may seem to us, in wartime, rationing is no acute problem in Caripito; but it faces a situation that is far more serious—scarcity. Prices of all commodities are extremely high. In fact, it is one of the most expensive places in the entire world to live. The only stable products that can be purchased are those imported from

the United States. Cigarettes cost two Bolivars (about 70 cents) a pack, smoking tobacco twenty dollars a pound when one is fortunate enough to find it. Rinso soap chips sell for one dollar a package (regular 39 cent size at the corner grocery), Coca-Cola, twenty-five cents, beer thirty cents a bottle, and butter one dollar a pound. On the average, board alone costs one hundred twenty-six dollars a month in addition to room and laundry. Recently a used 1941 model Ford sold for over $2,700, and the purchaser considered it a bargain; yet sporting goods and books are duty free and are relatively inexpensive. The reason for such invariably high prices is the enormous tax and tariff rates imposed upon imported commodities in general. Transportation accounts for but a small fraction of the total cost of the products.

Recreation is one word that is not in the average native's dictionary, but to the white man it plays an important part in his daily life. Many forms have been devised to assist him during leisure hours. Golfing, bowling, tennis, swimming, dancing and hunting are among the most popular activities. It seems that wherever a few Americans gather together in any corner of the globe, someone starts a club. Caripito is no exception. A sumptuous club has been built on a rounded summit near the village. It is surrounded by a lawn large enough for a nine hole golf course, bowling alleys, concrete swimming pool, and several tennis courts. Long rows of tropical flowers, trees and shrubbery have been artistically landscaped.

Almost every white person, young and old alike, is a member of the club and pays his daily visit to participate in sports and converse with friends. Being the center of attraction, Caripito Club, as it is named, furnishes its members a place where parties and social functions may be held. Since newspapers are almost nonexistent, it affords members an excellent opportunity to get local and "stateside" gossip and perhaps add a few contributions of their own.

One is impressed by the club's atmosphere, its cleanliness, and its size. It is well planned and constructed with a high ceiling, from which hang large oscillating fans, screened on all four sides to provide cross ventilation and protection against insects. The floor is designed of shining black and white checkerboard tile which adds to the pleasure of dancing. Bands from Trinidad and other nearby islands appear regularly to furnish music; during the remaining time, music is furnished by the familiar "juke-box."

A bar serves soft drinks, wine, rum, gin, but little Scotch because of its scarcity. Native boys serve the customers, and have learned never to have proper change in American money. Consequently, their tips are enormous. In one corner is a display of statues and trophies. One of these honors an American nurse who spent her life fighting tropical diseases. A large silver loving cup was won for producing a winning team in an Eastern Venezuela golf tournament. To the rear is the public library and barber shop. The library has more than a thousand volumes of which one-half are in English, the remainder in Spanish. A number of popular magazines can always be found on the reading tables but most of them are several months old.

A NIMROD'S HAVEN

Hunting is a favorite sport thruout the year. Ducks and geese are always plentiful in the swamps and there is no bag limit. Pheasants are in great demand for their most delicious meat. Deer, jaguars, boa constrictors, bushmasters, and rattle snakes are frequently killed by the natives. The tapir, which scientists believe has passed thru geologic history with very slight evolutionary changes, is abundant in dense reed thickets along the river. Its flesh is said to be well flavored, and its thick hide makes an exceptionally strong leather.

To a person visiting this outpost for the first time, one of the strangest and most peculiar birds in the fledgling stage is the hoactzin (pronounced ho-at'-sin). During this period of life it has well developed claws on each wing which enables it to crawl among the limbs and branches of a tree like a four footed animal using its claws as hands to grasp objects in reach. The fledglings are very active climbers; but as they grow older, these claws disappear. In the adult stage the hoactzin resembles a large pigeon, having a broad tail and huge feet for such short stumpy legs. This bird gives off a peculiar odor similar to rawhide, with a result that natives refer to it as the "stinkbird" or "stinking pheasant."

In the intolerable heat of mid-day, one becomes quite captivated by the acrobatic stunts of lizards. A constant source of pleasure is their unique ability to play hide and seek about the walk-ways or flower beds. There is no problem of preservation for these fellows. They go about their business of food gathering with the assurance that few animals possess. They wiggle their tails spasmodically to attract attention, creep cautiously upon unsuspecting

insects, and then capture them with a sudden whisk of their long sticky tongues. On a single lawn one may count fifty or more of these cold blooded reptiles, ranging in size from a few inches to over two feet. It seems as they dart from one cover to another that every color of the rainbow is displayed. None are poisonous.

Each evening just before dark large covies of coal black birds fly over the village from the eastern swamps to their mountain roosts, screaming loudly and apparently doing everything possible to make themselves heard. As the early morning sun rises, these birds again wing their way back to the lowlands to spend the day gabbing and feeding. Some members of the species possess the doubtful gift of gab even to a greater extent than do parrots. A phase of community recreation is to observe the antics of these birds.

15th and 20th Century Trails

Roads in Caripito are constructed of asphalt and are wide and smooth; but only a few roads extend into the jungles and they become almost impassable near the latter part of the rainy season. During the remainder of the year, vehicle transportation is carried on normally. In comparison with the few roads, it is astonishing to see such an unusually large number of company owned automobiles available to employees. More new model cars can be seen in this secluded place than in any American city twice its size. The company, fortunately, placed its order with the American automotive industry long before new models came off the assembly line; hence, they received their shipment a short time prior to the freezing of the market.

Most of the natives make little use of roads more elaborate than trails for their small burros. Practically all local trade is carried by this beast of burden. It is diminutive in size, weighing only two or three hundred pounds, but seemingly inexhaustible in energy. It can easily support a pack equalling half of its own weight. As one gazes from a summit down a winding trail toward the jungles, long lines of these tiny burros can be seen moving slowly toward the village under their heavy burdens of citrus fruit, bunches of bananas, and fresh vegetables.

Health and Education

Perhaps the most outstanding achievement of this community has been made in the field of health. A modern hospital with over one hundred beds has been erected on a hill south of the village. It

has a staff of three Venezuelan doctors, all of whom have done post-graduate work at some well-known American medical center. In addition, there are eight well-trained American nurses to assist in caring for the patients.

Some of the employees complain about the climate, about the working conditions, or about wages, but the majority would not leave for love nor money if they had the opportunity. This is their home. They are happy and contented among their friends. Many have lived here for years, without even a vacation. The latter, in their conception, is interpreted as a trip to the States, not merely a few days' absence from daily routine.

Probably no other climatic zone is plagued by such a variety of insects as a tropical savanna. Countless species of mosquitoes and flies breed in the swamps. They not only make life uncomfortable for man and beast alike but also spread dreaded diseases. Malaria is the most prevalent disease, but every precautionary method known to medical science is being applied. Stagnant waters surrounding the village have been drained, and other mosquito breeding places destroyed. At regular intervals special groups of laborers spray marshes with oil; not satisfied with this, they set fire to the rank grasses to complete the job.

Education is probably the most acute problem this outpost has to face. There are two elementary schools, one for the natives and the other for foreigners, with a total enrolment of sixty students. English is the language of instruction, but Spanish is also taught, since it is the national tongue. By the time elementary school has been completed, the students are able to speak one language as fluently as the other. Most students of fourteen and fifteen years of age have graduated from grammar school and are ready to come to America for advanced training. There are no high schools available at Caripito. For the majority, it is a very difficult transition from a small school in the tropics of Venezuela to a complex high school with hundreds of students racing from class to class at the sound of a bell.

Teachers of white children are Americans. Qualifications for such positions are incredibly high. One must have a college degree and postgraduate work in science, language, and art; and only those who have had previous teaching experience are selected. They must not only be good instructors, but must be able and willing to do missionary work as well. To compensate the chosen few, a three months' summer vacation with salary and free air transportation is furnished back to the States.

HASTA LA VISTA

It is a marvel how white man has been able to blaze a trail into such a jungle infested with insects, diseases, and unfavorable climatic conditions to build such a valuable outpost as Caripito. A number of lives have been sacrificed, connections with the outside world have been severed, and much hardship has been endured in order that a portion of American civilization, interested in the oil industry, be transferred to a remote part of another continent.

THE AREAS OF OLDER GLACIAL DRIFT IN THE MIDDLE WEST: A NEGLECTED ASPECT OF GEOGRAPHY

HOMER HURST
East Tennessee State College
Johnson City, Tennessee

THE PROBLEM

To the casual observer, and apparently to many who write about geography, the glaciated area of the Middle West is a region of general uniformity, characterized by rolling plains and lacking major land form variations. It is true that during the periods of glaciation smoothing was the dominant activity, both by cutting and by depositing. It is also true that surface features are relatively independent of underlying rock. All the same, there are observable topographic differences; and great variations in earth materials and land use do exist because of the effects of glaciation. So, notwithstanding the readiness to treat the Middle West as a uniform region, there are significant differences between the areas of younger and older drift.

It is important to recognize within the glaciated area the diversity which can be attributed to the visits of the various ice sheets. The areal extent of the portions covered by older drift is so great as to make necessary a clear separation from the areas of younger drift. Differences between areas of older drift and those of newer drift are, moreover, reflected in human use. Large sections of southern Ohio and Indiana, practically all of southern and western Illinois, the northern third of Missouri, the southern and western parts of Iowa, and strips in Minnesota, Wisconsin, South Dakota,

Nebraska, and Kansas are covered by the older drift left by the Nebraskan, Kansan, and Illinoian ice sheets. The natural and cultural landscape in these areas is quite at variance with that in the large areas which received their character from the younger Wisconsin sheets. As early as 1878 Chamberlin urged that the terminal moraine of the Wisconsin drift was a major line of division.[1] Drift deposited during the last period of glaciation includes till plains, marginal moraines, outwash plains and valley trains, and glacial lake deposits. The undifferentiated drift areas of earlier glaciation show an entirely different pattern.

While most textbooks in physical geography are careful to point out the driftless areas, they fail to make any clear distinction between areas of older and younger drift. Most maps merely show the areas covered by the Pleistocene ice sheets at their maximum extension. A check of four college textbooks reveals that attention is called to the fact that most of the United States north of the Ohio and Missouri rivers was invaded at least once by ice, but all glaciated areas are lumped together. A survey of seven texts and readers below the college level shows a similar inadequacy. The impression is often left that great fertility exists over the entire interior plains region, and that glaciation caused that fertility; that the surface configuration is as it was when the glaciers retreated; and that glaciation, if mentioned at all, can be treated as giving uniform results.

THE GENERAL NOTION ABOUT DRIFT AREAS

The typical young glacial plain presents flatness and consequent drainage problems. The hills are irregularly arranged, and moraines are prominent. There are many swamps, lakes, and marshes. Outwash plains, kames, eskers, and drumlins are prominent. The second advance of the Wisconsin ice left great boulder belts. Of paramount importance as far as human use is concerned is the fact that the earth materials of the newer drift are unweathered. Much plant food remains.

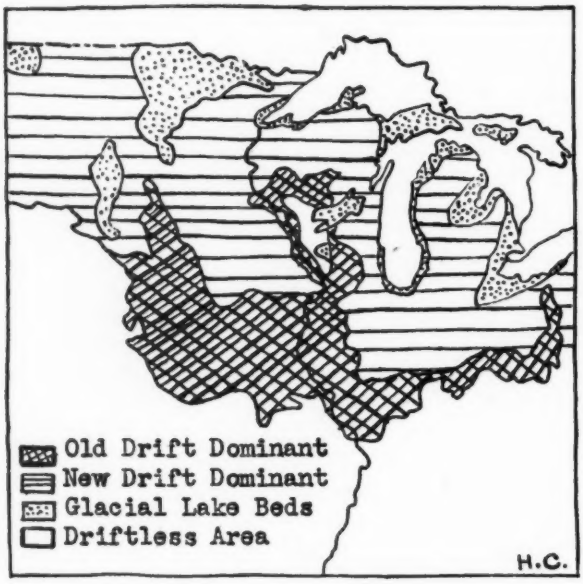
The character of the typical young glacial plain is too often stamped upon our thinking about the entire Middle West. The two Wisconsin sheets are the most important, because they came after the older drift had been deposited, and are therefore preserved. We accept a general physical and cultural uniformity, recognizing

[1] Thwaites, F. T. Outline of Glacial Geology, 1941, p. 77.

only modifications brought by man and his activities, and slight variations in latitude, rainfall, and temperature. The student of geography, and even the casual observer, may note the unglaciated areas, particularly the "Driftless Area." But, the several advances over the glaciated areas are not differentiated; thus, the importance of age of the glacial drift is overlooked.

The Old Drift

A few words will show extreme differences in glacial materials and their weathering in the areas of older drift. The Nebraskan in Iowa bears sand, gravel, peat, and old soil. There is a compact blue-black boulder clay. The Kansan drift of Kansas, Missouri, Iowa, and Nebraska is clayey till, with little water-laid material. The surface, once flat, is now eroded. The Illinoian is chiefly clay, with a marked absence of assorted drift. The boulder clay was probably very calcareous, but leaching has reached down five to eight feet. Nearly all of the limestone pebbles are removed. The Iowan till is thin, with many surface granitoid boulders. Outwash is scant, and moraines are feeble. All of these areas differ greatly from the places covered by Wisconsin drift.



Mid-West Glacial Drift

The older glacial drift is quite extensive in the Middle West.

The topography of the older drift commonly has well-developed drainage systems and a maturely dissected surface. The observable variations are due in part to distances from major streams. The point is that the surface configuration is tied up with the age of the drift. The older drift plains have experienced the reduction of original irregularities and the creation of new ones. Morainal

ridges are subdued, kettles are filled, kames are worn down, lakes are drained or filled. Erratic boulders are weathered, gravel is disintegrated or buried. Plains are better drained, and have finer and more uniform drift. On the other hand, erosion makes for irregularity. Valleys reach underlying rock. Where drift has been removed by washing, the features are like those of driftless areas.

Another fact is that weathering of the earth materials has reduced the productivity of the land, and has conditioned the demands which can be made upon it. Calcareous content has been reduced, lime has been carried away or downward. Nowhere are boulders the problem they are in the areas of younger drift.

In general, the areas of older drift are maturely dissected plains, altho the degree of dissection varies. There are, moreover, practically no swamps; consequently there are fewer mosquitoes and less malaria. One noteworthy consideration is the fact that there is less plant food left in the soil. The land will not hold up under the treatment often accorded the younger soils. In fact, building up is generally necessary if more than subsistence farming is to be carried on.

THE YOUNG DRIFT

The general effects of drift-age variations upon human occupance and use have been mentioned. The topography of the areas of younger drift, while causing less soil erosion than that of areas of older drift, has the problem of drainage. Neither surface drainage nor underground water systems are well-developed. The postglacial erosion cycle is in its youth. Further, tile must often be laid to keep productive crop land from becoming swampy. It should be pointed out that this is also a problem in some areas of older drift where distance from major streams has been a factor in leaving stretches of flat land.

Exceptions certainly exist, but terminal moraines of young drift sheets are noted for stony till; outwash plains are of a porous, gravelly, stratified, alluvial nature; eskers feature cobbly material; kettle and kame topography is marked by sandy hill-slopes and undrained hollows. Poorly drained flat soils have a high content of organic material. So, while older drift areas have been leached and eroded and have often lost organic remains, the relative shortness of the time for leaching in younger areas has contributed to the retention of soil properties which makes for better land. This is reflected in the value of soil products, density of population, and natural vegetation. However, it should be observed that some flat,

older drift areas which received lacustrine or alluvial deposits are also highly fertile. The black muck of Sangamon County, Illinois, for instance, was enriched because of defective drainage.

CULTURAL CONTRASTS

The present human-use and occupance of the Wisconsin drift areas is characterized by better roads, straighter lines of communication, and more important cities than are found in regions covered by the older sheets. In general, wealth is greater in regions of comparable latitude, buildings are better, and land values are higher. The land is given over to cash crops and the production of livestock, and there is more reliance on staples. All this is conditioned, of course, by distance from markets, proximity to watercourses, highways, and railroads, and nearness to considerable centers of population and industry.

The areas of older drift show more diversification, more subsistence farming, fewer dominant cities, poorer country roads, less pretentious buildings, sparser population, less wealth, and lower land values.

These conditions are especially noticeable if one contrasts the Illinoian drift area of southern Illinois with the Wisconsin drift area north of the Shelbyville Moraine, altho the range in altitude is small, and the merging of the Wisconsin border and the plain is generally gradual. The change in human occupance and use is sharp enough to cause the untrained observer to suspect that the Illinoian area had never been visited by an ice sheet.

CONCLUSION

We should remember that: (1) The younger drift is less extensive than the older in the Middle West. (2) There is only a limited covering of loess on the southern and western borders of the younger drift (it is nowhere thick). (3) The combined thickness of the younger and older drift is 100-150 feet. The exposed Illinoian is but thirty. Thus, in east-central Illinois the margin of the younger drift is 100 feet above the older. (4) Prominent recessional moraines are present in the younger drift. (5) Minor lobes existed in both, but the Illinoian effect on moraines was confined to the areas where the older drift is now buried. (6) A destructional difference is the lesser erosion of the younger drift.[2]

[2] Fenneman, N. M. Physiography of Eastern United States. McGraw-Hill Book Company, Inc., N.Y., 1938, p. 512.

If there is an inclination to query "What of it?" the answer is this: The areal extent of the region of older drift is great, and thousands of people are concerned. Disregarding loess capping, nearly two-thirds of the glaciated portion of Illinois, for example, has a surface sheet of Illinoian drift.

It is the thesis of this discussion that a few paragraphs should be devoted in geography textbooks to making clear the fact that great distinctions between areas of younger and older drift do exist. The effects upon human-use and occupance are such as to make it necessary to get away from the practice of considering the Middle West as a uniformly glaciated region.

MAP PRE-TESTS: DEVICES TO DISCOVER THE ABILITY OF PUPILS TO INTERPRET MAPS

NEVA MCDAVITT
State Normal University
Normal, Illinois

The ability to intelligently read and interpret a map is one of the prime essentials of successful geographic study and enjoyment. Many of us, as teachers, fail to stress map reading and to realize that pupils are not able to interpret successfully a map unless they are taught to do it. Furthermore, after the first teaching, we must constantly use maps to help interpret the geography lessons. We must test their abilities, re-teach and test again if we would be successful in helping our pupils master this essential geography tool.

I have found a short pre-test on the interpretation of maps an excellent device to discover inaccuracies and inabilities in map reading. It also reveals phases that need to be stressed in the re-teaching. I have used modifications of this type of test, early in the semester in both high school and freshman college classes.

DIRECTIONS FOR GIVING THE MAP READING TEST

1. Each pupil needs:
   A. A physical-political map of the United States (the size found in any geography text or atlas)
   B. A copy of the questions
   C. A sheet of paper on which to write the answers

2. Additional evidence of ability can be gained if the time is recorded on the paper at the beginning of the test and again as the pupil finishes his work.

Map Reading Test

1. In what general direction does the Mississippi River flow?
2. (A) In what state is the source of the Mississippi?
   (B) In what state is the mouth?
3. Name 4 tributaries of the Mississippi.
4. In going from New Orleans to St. Louis, do boats go downstream or upstream?
5. In going from Florence, Alabama, to Paducah, Kentucky, do boats go downstream or upstream?
6. What direction is Memphis from New Orleans?
7. If one degree of latitude is 70 miles, how far is it from New Orleans to Memphis?
8. Which is farther east, Pittsburgh, Pennsylvania, or Jacksonville, Florida?
9. Which is farther east, Reno, Nevada, or Los Angeles, California?
10. (A) Which is larger, Chicago, Illinois, or Buffalo, New York?
    (B) How can you tell by looking at the map?
11. (A) How far is it (by air) from Chicago, Illinois, to Detroit, Michigan?
    (B) How did you find the answer?
12. In what state does the Colorado River rise?
13. Name all the states it flows thru (or on the border) on its way to the sea.
14. In what state is the Grand Canyon of the Colorado?
15. Name the state of the United States that extends farthest south.
16. Name the state that extends farthest north.
17. What direction is Denver, Colorado, from Columbus, Ohio?
18. What direction is Miami, Florida, from Springfield, Illinois?
19. What direction is St. Louis, Missouri, from Springfield, Illinois?
20. What direction is Minneapolis, Minnesota, from Springfield, Illinois?
21. What is the elevation above sea level of
    1. Philadelphia, Pennsylvania
    2. Springfield, Illinois
    3. Denver, Colorado
    4. Pikes Peak, Colorado (a mountain)
22. Draw a horizontal line across your paper to represent sea level. Now take a trip by land across country from Cape Hatteras, North Carolina, to Memphis, Tennessee. Draw a line (using your sea level line as a base) showing where you walked uphill, downhill and on the level. (Make the land of highest elevation, the farthest above the base line, etc.) Make your east-west distance the same as it is on the map. Put the cities of New Bern, Charlotte, Asheville, Chattanooga, and Memphis in their proper places on your (trip) line.
23. (A) What is the elevation of the source of the Colorado River?
    (B) What is the elevation of the mouth?
24. What is the difference in elevation between the source and the mouth of the Colorado River?
25. How many feet below the level of the surrounding plateau is the Grand Canyon?

The following is another problem that has proved interesting and helpful in discerning ability in map reading as well as impressing on students the vast amount of geographic information that may be found on maps. It helps them to realize the necessity of forming the atlas habit—if they are to become good geographers.

Assignment: (To be dictated or given to the student in mimeographed form.)

John Brown lives with his wife and three children, Alice 18, Joan 12, and Junior 6, on a 240-acre farm located 10 miles from Bloomington, Illinois. The farm is owned by Mrs. Brown's father and John and Ella have lived there since their marriage. John's parents live in Bloomington and Ella's in Decatur.

Last week the Browns had a letter from a lawyer in Rosario, Argentina, informing them of their inheritance of a 500-acre farm located 6 miles from Rosario, willed to them by John's Uncle James who had lived in Argentina many years before his recent death.

John remembers that his college roommate, Jim Steele, is now living in Rosario.

Shall the Browns move to their new inheritance in Argentina?

Choose (A) or (B)

(A) Write the letter that John writes to Jim Steele telling him of their decision "to move" or "not to move" and *why.*

(B) Write the letter Jim writes to John giving him friendly advice to help the Browns make their decision—"to move" or "not to move."

Further directions

(A) Use nothing but your atlas, preferably Goode's School Atlas, Rand McNally and Company, Chicago, for your information.

(B) Use footnotes to designate the maps used to "back up" your statements.

It is a surprise and pleasure to most students to realize that the geographic environment of Rosario is so much like that of central Illinois, and that the reasons the Browns choose to move (if they do) are almost entirely economic and geographic. While if they choose not to move, the reasons are almost all sentimental—the ties of home, of friends, of country, of schools they know, etc. This is always brought out strongly by reading samples of letters in which the family moves to Rosario and others in which they choose to remain in central Illinois.

GEOGRAPHICAL PUBLICATIONS

Elmer W. Cressman. **The History of Pennsylvania.** 128 pp., 61 pictures and maps. Noble and Noble, New York, 1944. $1.28

In *The History of Pennsylvania,* Dr. Cressman paints the picture of the development of the Commonwealth in broad and sweeping strokes. Beginning with the original Indian tribes and coming down to the Atlantic Charter and World War II, he shows how Pennsylvanians have contributed to the formation of our democratic institutions. For example he suggests that Molly Pitcher, of Revolutionary War fame, was our first WAC. The book is aimed to provide a semester's work for the ninth grade. The subject matter is treated in twenty units which are more or less independent. Six units deal with wars and disputes, three with settlement, three with biographies, two with government, and one each with industries, transportation, education, arts and sciences, famous buildings, and the introduction. One fifth of the book is devoted to a copy of the Pennsylvania Constitution. Some general suggestions for procedure are discussed in the foreword and short tests and review questions are found at the conclusion of most units. The book is well supplied with photographs but is woefully lacking in good maps. It is most unfortunate that the only map of Pennsylvania shows very few place locations and gives the wrong impression of the topography. Much of the material presented is factual, little attempt being made to show the cause and effect relationships. A striking omission is the absence of any reference to Pennsylvania's part in the development of the conservation program of the nation. In the hands of a teacher well trained in geography, this history should make a worthwhile contribution to the education of young Pennsylvanians.

WARREN STRAIN

State Teachers College
Slippery Rock, Pennsylvania

Walter W. Ristow. **The Trans-Orbal Map.** Global Press Corporation, 381 Fourth Avenue, New York. 1944. $1.00

The trans-orbal map is drawn as if one were looking at and thru a transparent globe. The features on the near side of the globe appear boldly, those on the far side, faintly. It is a unique experiment in map making and is quite an attractive ornament. But since it lacks simplicity, clarity, and accurate presentation of geographic concepts, it is of limited value as a teaching device. It is much more likely to confuse than to inform the grade school pupil. (Note the apparently antipodal relation of Nova Zembla and New Zealand). For teaching purposes, this map has little of value not possessed by any well made orthographic projection.

A. K. BOTTS

State Teachers College
Trenton, New Jersey

Kirtley F. Mather. **Enough and to Spare.** Harpers, 1944. $2

The appearance of Kirtley F. Mather's *Enough and to Spare* was perfectly timed. This volume contains so important a message that it would be well if every intelligent American could read it.

Dr. Mather discusses the world's population, pointing out that population trends indicate a saturation point not far from the present world total of two billions. He asserts that the Malthusian theory of progressive overcrowding and starvation is fundamentally false. Says he, "whatever the future may hold in store for mankind, during

the last 25 years the means of subsistence have increased more rapidly than the population. This is the result not of expansion into previously uninhabited or sparsely populated regions, but of more efficient utilization of resources already at hand." This is tantamount to saying that man is geographically harmonizing his way of life with the forces and factors of his natural environment.

The author then reviews the world's resources, (1) the renewable ones (water power, soil, forests, etc.) and (2) the non-renewable ones (minerals, principally metals). He considers the first group to be permanent and the second to be in no immediate danger of exhaustion provided man intelligently conserves. In short, there is little danger of a famine in raw materials so far as the earth as a whole is concerned. "Mother Earth," he says, "is rich enough to nourish every man in freedom; it is man, not Nature that enslaves."

No one country or no one continent can provide all the necessaries of modern life, for in her distribution of resources, Nature has been cruel and definite. And this leads to the fundamental question: Can the earth's two billion inhabitants so organize themselves as to utilize these resources without friction. The decision is man's, for he is master of the world in which he lives. But "the path of life is strewn with the bones of those who failed to make the necessary adjustments to the new conditions of new times."

Man is now at the crossroads: he must make his decision; will he scramble unnecessarily to survive or will he abide by the law (not sentiment) of the Golden Rule? His natural resources are adequate for victory; so are his intellectual resources. Only his spiritual resources are in doubt. Unless he chooses wisely, he will lose all he has attained.

LANGDON WHITE

Stanford University

Stanley A. Cain. **Foundations of Plant Geography.** 556 pp.; maps, glossary, references, index. Harper and Brothers, 1944.

Most geographers will find little of value or even of interest in this book for its relations with geography are far removed. The author's use of the terms "geography" and "geographers" seems to indicate a complete lack of understanding of the fact that there is a well-established field of geography. The title is unfortunate because it focuses attention on geography rather than on biology where its contribution really is made.

Plant geography is presented as a dual field of description and interpretation which is a borderline science of synthesis and intregration "compounded of physiology and ecology, cytology and genetics, taxonomy and evolution, paleontology and geology, comparative morphology and floristics." An imposing list of 720 items are included in the cited literature, only a few of which are the work of well-known geographers.

Since this book is in the field of biology it is neither the obligation nor the privilege of geography to appraise its botanical contributions. No doubt its extensive development makes a great contribution in that field. Its thirty chapters are arranged in five parts: Introduction, Paleoecology, Areagraphy, Evolution and Plant Geography, and Significance of Polyploidy in Plant Geography.

The use of such terms as "paleoecology" and the introduction of "areagraphy" are characteristic of an extremely wordy style of writing. Numerous intriguing ideas are literally drowned in a deluge of polysyllabic words. A glossary of two hundred and eighty terms is included, some of which seem to be at variance with established usage. Numerous sketch maps, all without coordinates, are used.

JOHN H. GARLAND

University of Illinois

J. M. Longyear, J. H. Rowe and H. L. Movius: **Archaeological Studies.** Peabody Museum, Harvard University, pp. 100, 84, 135, illus. Cambridge, 1944

These three studies are scholarly discussions of excavations in three scattered localities. Longyear discusses El Salvador in Central America, especially the pre-Colombian pottery. The ruin most studied appears to have been inhabited from about 850 to 1060 A.D. Rowe discusses the archaeology of Cuzco, Peru, which lies on the eastern slope of the Andes at an elevation of about 11,000 feet. The present city contains about 44,000 people. Cuzco was the capital of a large Inca empire before the Spaniards came in 1533; it was largely destroyed by an earthquake in 1650. A railway arrived in 1910; the people now are almost entirely mestizos. This study concerns about 1130-1530 A.D.; its chief archaeological contribution is considerable new evidence of the earlier centuries. Movius' paper is about southern and eastern Asia, with special attention to the Glacial Period. Northwestern India, Northern Burma, Java and Northeastern China are discussed. A chronology is developed. Human remains date from the first inter-glacial epoch.

These technical papers, sent to the JOURNAL for review, will interest relatively few of our readers, but merit mention, as reports of significant recent discoveries.

STEPHEN S. VISHER

Indiana University

Jordan, Peter. **Central Union of Europe.** 110 pp., with 25 full page maps and an introduction by Earnest M. Patterson. Robert M. McBride & Co., N.Y., 1944. $2.00.

The author of this volume has one aim in mind: to promote security in Europe by urging the formation of a federal union of eleven of Europe's smaller states—Esthonia, Latvia, Lithuania, Poland, Czecho-slovakia, Hungary, Rumania, Yugoslavia, Bulgaria, Albania, and Greece. As the author sees it, this federation, forming a solid front reaching from the Baltic to the Aegean and lying between Germany and Russia, would not only open the doors to economic advancement such as this section of Europe has never seen, but would create a union which would enable these small states to act as one against any possible threat of aggression.

The proposed state would have a population of 120,000,000. While not thought of as an especially rich area, it would have enough diversity of natural wealth to give a satisfactory prosperity to its inhabitants. The establishment of a customs union, long needed in this part of Europe, would make for healthy economic development. More significant to the author, however, is the belief that the day of the small state is over, and that united political action on the part of these eleven peoples would give them the physical and moral strength needed to check imperialist tendencies in this part of Europe.

The author admits that serious obstacles would have to be surmounted before such a federation could be formed, and that no such formation is likely unless the lead is taken by outside powers, especially the United States and England.

The author wastes no words in the development of his thesis. The trend of current diplomacy, however, appears to be running counter to his proposals. The volume is worthy of notice, nevertheless, because of the author's informative, analytical approach and because his work is another of the great mass of current writings which plead the cause of collective action.

THEODORE L. NYDAHL

State Teachers College
Mankato, Minn.